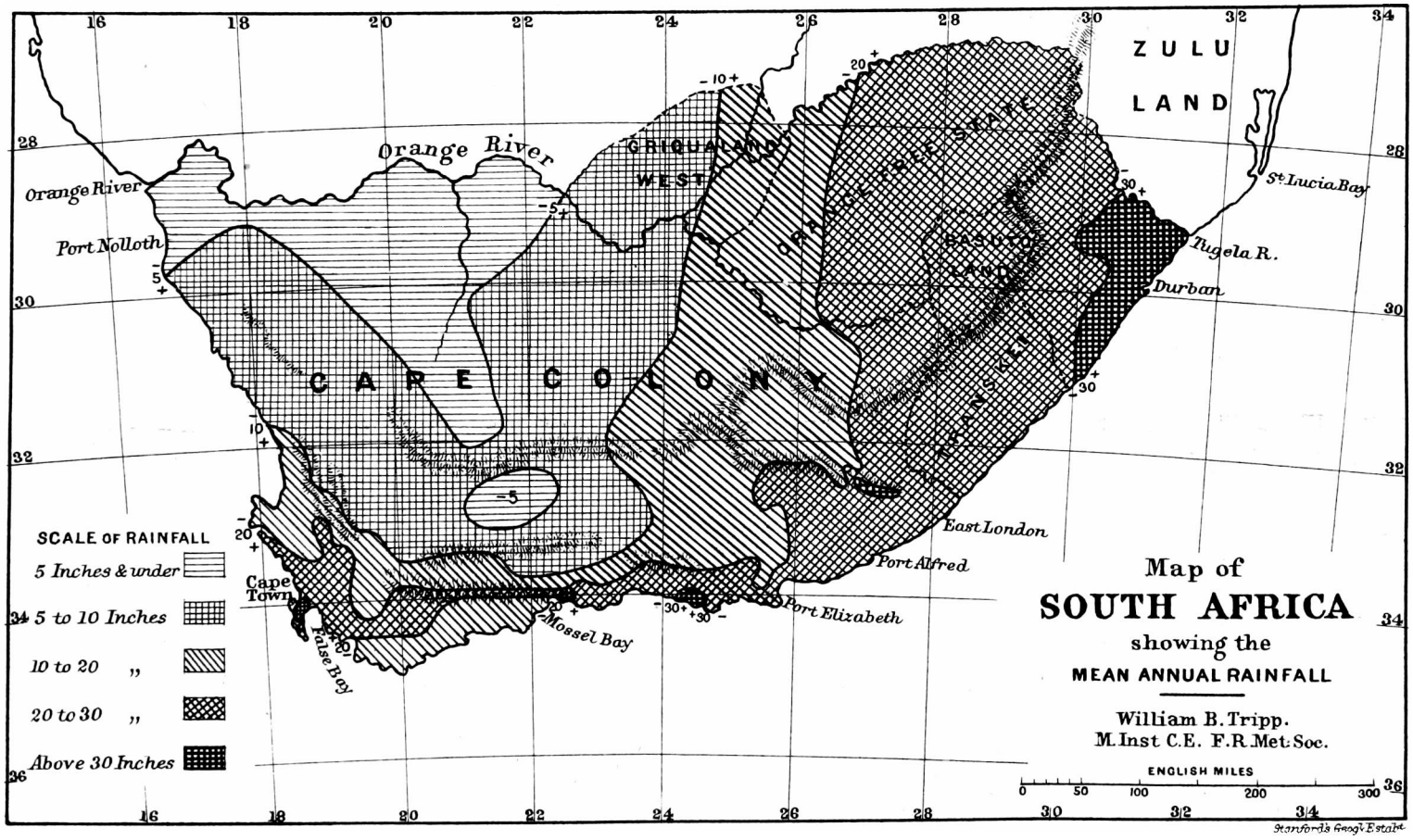
Map of
SOUTH AFRICA
showing the
MEAN ANNUAL RAINFALL
William B. Tripp.
M. Inst C.E. F.R.Met.Soc.
SCALE OF RAINFALL
5 Inches & under
5 to 10 Inches
10 to 20 ,,
20 to 30 ,,
Above 30 Inches
ENGLISH MILES
0 50 100 200 300
CAPE COLONY
ZULU LAND
GRIQUALAND WEST
ORANGE FREE STATE
BASUTO LAND
NATAL
Orange River
Port Nolloth
Cape Town
False Bay
Mossel Bay
Port Elizabeth
East London
Port Alfred
St. Lucia Bay
Tugela R.
Durban
Stanford's Geogl Estabt

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RAINFALL IN SOUTH AFRICA.

BY WILLIAM B. TRIPP, M.INST.C.E., F.R.Met.Soc.

1. Little has been known until recently on the subject of Rainfall in South Africa, taken broadly over the whole country, although observers have for many years been keeping records at isolated stations.

2. There has also been for many years a Meteorological Commission in existence at Cape Town, and in the report for 1883 an interesting table was published giving the means, monthly and yearly, at all stations where records have been kept for at least five years, with the altitude above sea level, and the latitude and longitude for each station.

There are also given in the reports several additional records of stations where the registers are not complete.

From these data the writer has coloured a map of South Africa, with the idea of showing the distribution of the total yearly rainfall; the curves divide the area into districts where the mean yearly rainfall is--

(1) Under 5 inches.
(2) From 5 ,, to 10 inches.
(3) ,, 10 ,, ,, 20 ,,
(4) ,, 20 ,, ,, 30 ,,
(5) Above 30 ,,

He has also compiled a table which gives the quarterly rainfall at some of the stations above referred to, at which records have been kept for at least five years, with other particulars of altitudes and wettest months, &c.

With regard to the map, there are many parts where the results are merely approximate.

The positions also of many places on even the best published maps of South Africa do not agree with their positions as indicated by the latitudes and longitudes given in the reports, indicating that the former positions are in many cases erroneous.

These differences would make, in many cases, a considerable

difference in the position of the curves, &c.; in fact, a new and thoroughly revised map of South Africa is much required.

There are also, doubtless, particularly along the mountain ranges, many wet strips and spots where no definite records are kept, and which, therefore, cannot at present be shown on the map. Multiplication of records, as well as general local knowledge, will, no doubt, reveal many such places.

3. South Africa may be described as a central table land, rising in successive terraces from the sea coast. The country has been subject to great erasion from water, and the mountains with which the country is studded, and the deep valleys, locally termed "kloofs," with which it is intersected, are principally due to this cause.

In some cases the hills are covered with forests, but generally they are now denuded of such covering. Where forests still exist, the author considers it probable that the rainfall is much greater than would be the case if they did not. The hills themselves are, however, doubtless the chief agents in causing precipitation, and they have, of course, to be taken as they are found in nature; while the hand of man can, in many cases, clothe them with forests, and the author considers this to be most important. For there is this difference in the result of the rainfall, as its useful effects are seen in the streams which issue from the mountain "kloofs." When these take their rise in an area denuded of forest, their volumes are highly variable, their beds being dry for, in some cases, 300 days in the year; their only existence being, in fact, as torrents after sudden thunderstorms.

When, however, it fortunately happens that the streams take their rise in an area still largely clothed with forests, they are frequently perennial, as the action of the forest tends to keep the soil moist and cool, preventing evaporation and enabling the rain to soak into the ground and fill the underground reservoirs, from which it flows in constant streams capable of being utilised in various ways for the service of man; whereas in the other case, the effects of the rain are transient and much less valuable, and in many cases disastrous.

Thus forests, where they exist, produce a result similar to that which could be effected by the construction, at considerable cost, of a series of storage reservoirs. The author therefore considers it of the highest importance, for various climatic and economic reasons, that the efforts which have been inaugurated of late years by the Cape Government for the preservation, renewal, and creation of forests should be continued with energy and perseverance.

4. The climate over such a large tract of country as South Africa varies, of course, considerably; the rainfall varies from 2 in. to 50 or 60 in. doubtless, and perhaps more in some of the mountain districts; in the N.W. corner of Natal it is considerably over 30 in.

Dividing the country according to the half-yearly distribution of rainfall, we find tat on the western and southern sides the fall is generally greater in the winter half of the year from April to Septem-

ber, than in the summer half from October to March ; May, June and July being the wettest months, and the N.W. the general rain-bearing wind. On the eastern side, however, the fall is greater in the summer half, March and February being the wettest months, and the S.E. the rain-bearing wind.

On the south east coast these dividing line between these two different characteristics appears to run out to sea very nearly at Port Alfred, where the fall in both halves of the year appears to be very nearly identical, that in the summer half being rather the greater of the two.

The writer resided and kept records for some years at King William's Town in the Eastern province, where on a total of 283 days, from June 1880, to May 1883, 70 in. of rain were registered, 30·25 in. of which (recorded on 242 days) were made up of falls under 0·50 of an in., 19·88 in. (on 28 days) from 0·50 in. to 1 in., and 19·87 in. (on 13 days) of falls of from 1 in. or upwards in twenty-four hours.

The heaviest fall on any one day was 2·04 in., and the next heaviest fall was 3·11 in. in 48 hours.

Although this record proves that the rains are moderate and tolerably distributed, and do not all occur in sudden storms, yet the writer has heard accounts of sudden falls there of a very different character, and most disastrous in their results.

Quarterly Rainfall at some of the Stations given in the Report of the Cape Town Meteorological Commission for 1883, at which records have been kept for at least five years, with the height of the station above sea level, and division into the Meteorological Districts.

LOCALITY, &c.	Elevation above Sea Level	Jan. to March.	April to June.	July to Sept.	Oct. to Dec.	Totals.	Wettest Month.
	ft.	in.	in.	in.	in.	in.	
1.—CAPE PENINSULA. *Six Stations given in the Report.*							
Royal Observatory.....	37	2·24	10·18	8·91	3·48	24·81	June
Bishops Court	250	3·97	21·52	19·84	8·23	53·56	June
June is the wettest month at all stations except Simon's Town, at which May and July are equal, and have the fall slightly greater.							
2.—SOUTH WEST. *Nine Stations.*							
Somerset West	100	2·20	9·20	9·05	3·72	24·17	July
Stellenbosch	400	2·05	9·71	8·63	4·27	24·66	May
Paarl	500	1·89	11·29	11·44	5·41	30·03	June
Robertson	600	1·72	3 54	3·36	2·27	10·89	April
July has the greatest fall at four out of the nine stations, May comes next with three, April and June follow with one each.							
3.—WEST COAST. *Six Stations.*							
Groote Port, Malmesbury ...		1·56	7·13	7·11	2·71	18·51	May
Clan William	300	0·69	3·75	3·31	1·46	9·21	July
Piquetberg	770	1·51	5·92	6·51	3·50	17·44	Aug
At three stations May has the greatest fall, at two July, and at one August.							

4.—SOUTH COAST. *Seven Stations.*

Bredasdorp	250	4·46	5·13	5·29	3·85	18·73	Mar.
Mossel Bay	105	4·32	3·53	5·02	3·10	15·97	Feb.
Port Elizabeth.....	181	4·48	6·19	6·19	6·09	22·95	May

At four stations March is the wettest month, May and October at one each.

5.—SOUTHERN KARROO. *Five Stations.*

Lady Smith	2000	3·19	3·38	3·34	2·02	11·93	April
Amalienstein	1500	3·63	3·58	3·17	3·36	13·74	May
Ondtshorn	1000?	1·92	2·41	2·75	1·45	8·53	Aug.

April and August are wettest at two stations each, and May at one.

6.—WEST CENTRAL KARROO. *Six Stations.*

Prince Albert	2100	2·14	2·97	1·14	1·46	7·71	April
Lower Nels. Poort.....	3100	4·81	1·87	1·51	1·93	10·12	Mar.

At five out of the six stations March has the greatest fall, at the remaining one April.

7.—EAST CENTRAL KARROO. *Nine Stations.*

Graaff Reinet	2500	5·48	2·62	2·22	4·22	14·54	Feb.
Somerset East...	2400	8·80	3·71	2·97	5·97	21·45	Mar.

March is the wettest month at seven stations, February at two.

8.—NORTHERN KARROO. *Twelve Stations.*

Cradock	2856	6·49	2·21	1·78	2·71	13·19	Mar.

March is the wettest month at all the stations.

9.—NORTHERN BORDER. *Three Stations.*

Pella	1800	0·78	0·97	0·22	0·24	2·21	May
Hopetown.....	3600	5·80	1·79	1·07	2·07	10·73	Mar.

At two stations March, and at one May, are the wettest months; there is no rain at Pella in November.

10.—SOUTH EAST. *Nine Stations.*

Grahams Town	1800	8·67	5·45	6·24	8·43	28·79	Mar.
King Williams Town...	1314	9·47	4·29	4·12	7·84	25·72	Feb.
East London, W.	20	7·95	6·66	6·79	6·52	27·92	Mar.

March wettest month at eight, February at one station.

11.—NORTH EAST. *Three Stations.*

Queens Town	3500	10·11	2·86	1·69	5·98	20·64	Mar.
Aliwal, N.	4400	12·37	3·66	1·74	6·91	24·68	Feb.

March wettest at two, February at one station.

SUMMARY OF WETTEST MONTHS.

March	at	40	stations.
May	,,	9	,,
July	,,	6	,,
June	,,	6	,,
Feb.	,,	5	,,
April	,,	4	,,
Aug.	,,	3	,,
Oct.	,,	1	,,
Also May and July equal and wettest at		1	,,
Total ...		75	stations given in the Report.

REVIEWS.

Lightning Conductors, their History, Nature and Mode of Application. By RICHARD ANDERSON, F.C.S., &c. Third Edition, revised, rearranged and enlarged. 8vo., xv.—470 pages. London: E. and F. N. Spon, 1885.

WE are glad to find that Mr. Anderson's work upon Lightning Conductors has reached a third edition, and to note that in its preparation the author has had the assistance of the long and varied experience of Dr. R. J. Mann. The book is so large and so good that one might almost dismiss it with the verdict that it tells everything that there is to tell about lightning conductors, and never leads one wrong; but as it has got to the 3rd edition, it may get to the 13th, and if so, some of the following remarks may be useful.

It wants a list of engravings; such a list often enables one to turn up a paragraph readily, and in this book it might have prevented some repetitions, *e.g.*, page 344 and 234. We may mention that the engravings are numerous and generally very good, but on p. 179, a faulty engraving in Callaud's *Traité* has been copied as accurately as the Chinaman did when he cracked all the 24 new plates in the places corresponding to the crack in the pattern one. There are two other things to note about the engravings. Mr. Anderson is (rightly we think) an advocate for conductors in the form of tape rather than of rope. We have been so amused by the frequency with which he gives engravings of rope as compared with tape, as to have had them counted with the curious result that there are nearly three times as many representations of rope as of tape. Sometimes engravings appear without explanatory text, *e.g.*, on p. 118 there is a little gem, illustrative of the area of protection afforded by a conductor on a church tower, but we can find no reference to the engraving in any part of the volume, and the subject does not appear to be even mentioned within 11 pages of the engraving.

Mr. Anderson quotes the case of Mrs. Pidgeon, who was struck and marked by lightning near Torquay, but he does not seem to have heard of the clenching case of the boy George Gunn, of Dunse, Berwickshire, in which the so-called tree form was photographed before it faded away.* And similarly he has overlooked the remarkable parallelism between the accident near Crieff, of which he gives an excellent engraving on p. 312, and the accident at Lilleshall, in Shropshire, in 1884, reported and engraved in the *Quar. Jour. Roy Met. Soc.*, Vol. XI., p. 7.

His list of accidents and his bibliography are very valuable, but each will bear a little more time spent upon it: *e.g.*, p. 322, Rubinslaw should be Rubislaw; p. 324, "West End Church, near Southampton," and "St. James's Church, West End, Hants," are probably identical; p. 325, "Clevendon" should be "Clevedon," and "Rolley' "Trolley."

* *Met Mag.*, Vol. XVIII. (1883), pp. 81, 104, 120.

So, again, in the list of books there are a lot of little trifles which may as well be put right: *e.g.*, on p. xi. "Fait E. M." should be "Macfait E." or "Fait E. Mac." "Forster, J." should be "Forster, T.," and the description of the two editions of Ganot are rather "mixed."

These, however, are all trifles, and the book itself, like one of Captain Toynbee's logs, may be dismissed with the title "Excellent."

Report on the East Anglian Earthquake of April 22nd, 1884. By RAPHAEL MELDOLA, F.C.S., &c., and WILLIAM WHITE, F.E.S. (*Essex Field Club Special Memoirs, Vol. I.*) 8vo., x.—224 pages, 19 cuts and 4 plates. London: Macmillan & Co., 1885.

Events follow each other in such swift succession that even the great English earthquake—certainly the greatest for four centuries—is on the high road to oblivion within two years of its occurrence. Professor Meldola's report is, however, well worth waiting for; it is a very thorough piece of work, and the way in which he dissects both popular notions and scientific theories is quite amusing. The result is that we have in one volume a complete account of the earthquake, with its damage to 20 churches, 11 chapels and 1,213 buildings, and yet without the loss of one human being, and an exhaustive criticism on all branches of the subject.

Nor have Messrs. Meldola and White been left alone in the work, for though on them has fallen all the actual labour of writing the report, they have had help from two of the most experienced living seismologists—Prof. Ewing, a past President of the Seismological Society of Japan, and Prof. Milne, the present Secretary of that great Earthquake Society. Among the geologists whose views are reported we note several members of the Geological Survey, *e.g.*, Messrs. Holmes, Kinahan, Topley and Whitaker, also Prof. O'Reilly and Mr. Woodward. With reference to the disturbance of the level of water in wells, there are the views of Prof. Bonney, F.R.S., Mr. Clegg, C.E., Mr. Radford Sharpe, and Mr. De Rance, F.G.S.

As we have already stated, it is at least four hundred years since an equally violent earthquake has occurred in this country; it is fortunate for science that the Essex Field Club possessed two members with the knowledge and the industry requisite to produce such a report out of the chaos of manuscript which had been collected, and that the Club has had the courage to incur the cost of printing and illustrating it. Let all who wish well to a rising scientific society, and all who are interested in earthquakes, British or Foreign, support the Club and encourage those who have had the labour of preparing the report by procuring a copy, which we are sure will interest them and instruct them.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1885.

STATIONS. *(Those in italics are South of the Equator.)*	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		
England, London	84·7	4	41·4	11	70·9	50·7	48·3	67	127·4	36·4	1·99	11	4·9
Malta	90·4	19	58·8	8	79·9	64·8	61·5	71	140·6	...	·00	0	1·4
Cape of Good Hope	71·2	1	34·0	1	63·3	46·8	...	...	...	...	6·18	13	4·7
Mauritius	79·2	1	59·8	21	75·0	65·3	60·3	74	123·6	46·2	4·36	22	5·3
Calcutta	103·3	2	76·2	19	92·7	79·4	77·7	80	162·5	72·4	11·40	18	6·9
Bombay	92·7	8	77·0	11	89·0	81·1	77·3	78	153·2	74·2	5·11	22	6·7
Ceylon, Colombo	86·7	11*a*	72·6	7	83·8	75·6	74·3	84	150·0	65·0	18·82	26	8·5
Melbourne	62·1	1	30·2	22	53·8	42·8	42·4	81	114·3	21·1	3·63	18	7·2
Adelaide	62·5	1	36·0	12	57·6	45·4	43·4	74	120·8	26·3	3·23	24	6·1
Wellington	60·3	8	34·5	24	55·7	44·1	44·7	83	115·0	29·5	3·87	9	3·8
Auckland	62·5	28	40·0	15	59·1	48·8	47·8	79	118·0	29·0	2·16	12	6·8
Jamaica, Kingston	92·0	27	70·6	13	87·0	74·0	73 0	77	...	...	·46	...	5 3
Barbados	84·0	27	71·0	var.	82·0	73·0	74·4	82	145·0	...	2·47	15	7·0
Toronto	79·1	27	41·5	9	70·8	49·0	51·2	70	...	34·5	4·19	12	5·0
New Brunswick, Fredericton	86·7	26	35·5	7	73·2	48·4	51·1	70	...	...	3·33	18	6·2
Manitoba, Winnipeg	83·8	30	31·4	8	71·0	47·2	53·3	73	...	...	3·05	12	5·0
British Columbia, Victoria	5·0	27	41·0	2	65·7	48·6	...	...	...	...	·25	8	...

a And 27. *b* And 15.

REMARKS, JUNE, 1885.

MALTA—Mean temp. 71°·1 ; mean hourly velocity of wind 9·5 miles ; sea temp. rose from 70° to 77°. J. SCOLES.

Mauritius.—Rainfall 2·14 in. above, mean temp. 0°·7, and mean hourly velocity of wind 0·2 mile below average ; prevailing wind S.E. by E, extremes of velocity 28·9 miles on 10th and 1·9 mile on 25th. C. MELDRUM, F.R.S.

Colombo.—TSS on 1st, T on 3, and L on 6 other days. J. H. SYMONDS.

Melbourne.—Mean temp. of air 1°·4 and of dew point 1°·0 below average ; rainfall 1·71 in., humidity slightly, and amount of cloud ·6 above average ; prevailing winds N. and W., strong breezes on 9 days ; L on 3 days, H on 1, dense fog on 4. R. L. J. ELLERY, F.R.S.

Adelaide.—Rainfall nearly 0·60 in. and mean pressure 0·110 in. above the average of 28 years ; mean temp. more than 2° below the average. W. E. COOKE.

Wellington.—A fine month with few wet days ; N.W. wind till 20th, frequently strong, then easterly and light ; mean temp. (49°·9) 0°·9 above the average ; rainfall 1·38 in. below the average. T on 8th. fog on 3 days. R. B. GORE.

Auckland.—An unusually fine month ; rainfall not half the average ; mean temp. about the average of 18 years ; pressure considerably above the average. T. F. CHEESEMAN.

JAMAICA.—Rainfall only half the average, and the continual drought was severely felt over the greater part of the Island. A slight shock of earthquake was felt in St. David's between 7 a.m. and 8 a.m. on 16th. MAXWELL HALL.

BARBADOS.—Rainfall very small, the total for June having been less on only six occasions in 34 years ; mean temp. (76°) about the average ; pressure unsteady ; mean hourly velocity of wind 13·4 miles, 10 per cent. above the average ; extremes 18·4 miles and 8·8 miles. R. BOWIE WALCOTT.

SUPPLEMENTARY TABLE OF RAINFALL, DECEMBER, 1885.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain
		in.			in.
II.	Dorking, Abinger	1·50	XI.	Rhayader, Nantgwillt..	3·34
,,	Margate, Birchington...	1·08	,,	Carno, Tybrith	2·01
,,	Littlehampton	1·13	,,	Corwen, Rhug	1·14
,,	Hailsham	1·21	,,	Port Madoc	2·55
,,	I. of W., St. Lawrence.	1·81	,,	I. of Man, Douglas	2·11
,,	Alton, Ashdell.....	1·86	XII.	Stoneykirk, Ardwell Ho.	1·75
III.	Winslow, Addington ...	·96	,,	Melrose, Abbey Gate...	1·45
,,	Oxford, Magdalen Col...	1·02	XIII.	N. Esk Res. [Penicuick]	1·85
,,	Northampton	·63	XIV.	Ayr, Cassillis House ...	...
,,	Cambridge, Beech Ho...	·79	,,	Glasgow, Queen's Park.	2·19
,,	Wisbech, Bank House..	·80	XV.	Islay, Gruinart School..	3·74
IV.	Southend	1·08	XVI.	St. Andrews, Pilmour Cot	1·01
,,	Harlow, Sheering	·89	,,	Balquhidder, Stronvar..	6·62
,,	Rendlesham Hall	1·06	,,	Dunkeld, Inver Braan..	2·70
,,	Diss	1·30	,,	Dalnaspidal H.R.S. ...	5·28
,,	Swaffham	1·39	XVII.	Keith H.R.S.	2·32
V.	Salisbury, Alderbury...	1·42	,,	Forres H.R.S.	1·78
,,	Warminster	1·27	XVIII.	Strome Ferry H.R.S....	10·71
,,	Calne, Compton Bassett	1·27	,,	Lochbroom	10·16
,,	Ashburton, Holne Vic..	3·73	,,	Tain, Springfield.....	1·45
,,	Holsworthy, Clawton...	1·74	,,	Loch Shiel, Glenaladale	18·81
,,	Hatherleigh, Winsford.	3·16	,,	Invergarry	9·60
,,	Lynmouth, Glenthorne.	2·09	XIX.	Lairg H.R.S.	1·98
,,	Probus, Lamellyn	2·00	,,	Forsinard H.R.S.	2·33
,,	Wincanton, Stowell Rec.	1·41	,,	Watten H.R.S.	2·87
,,	Wells, Westbury.....	1·64	XX.	Dunmanway, Coolkelure	4·42
VI.	Bristol, Clifton	1·23	,,	Fermoy, Gas Works ...	1·87
,,	Ross	1·02	,,	Tralee, Castlemorris ...	2·02
,,	Wem, Sansaw Hall.....	·52	,,	Tipperary, Henry Street	1·81
,,	Cheadle, The Heath Ho.	1·07	,,	Newcastle West	2·11
,,	Worcester, Diglis Lock	1·07	,,	Miltown Malbay.....	1·83
,,	Coventry, Coundon	·59	,,	Corofin	...
VII.	Melton, Coston	·87	XXI.	Carlow, Browne's Hill..	·82
,,	Ketton Hall [Stamford]	·92	,,	Navan, Balrath	·90
,,	Horncastle, Bucknall ...	·80	,,	Mullingar, Belvedere ...	1·07
,,	Mansfield, St. John's St	·63	,,	Athlone, Twyford	1·07
VIII.	Macclesfield, The Park.	2·38	XXII.	Galway, Queen's Col....	1·22
,,	Walton-on-the-Hill.....	1·64	,,	Clifden, Kylemore	2·75
,,	Lancaster, South Road.	1·39	,,	Crossmolina, Enniscoe..	2·90
,,	Broughton-in-Furness ..	...	,,	Carrick-on-Shannon ...	2·01
IX.	Wakefield, Stanley Vic.	·31	XXIII.	Dowra	...
,,	Ripon, Mickley	·71	,,	Rockcorry.....	1·71
,,	Scarborough.....	1·09	,,	Warrenpoint	1·29
,,	East Layton [Darlington]	·61	,,	Newtownards	·68
,,	Middleton, Mickleton ..	1·23	,,	Belfast, New Barnsley..	2·20
X.	Haltwhistle, Unthank..	1·65	,,	Cushendun	4·05
,,	Shap, Copy Hill	3·56	,,	Bushmills	2·73
XI.	Llanfrechfa Grange	1·97	,,	Stewartstown	1·47
,,	Llandovery	2·44	,,	Buncrana	2·97
,,	Castle Malgwyn	1·49			

DECEMBER, 1885.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max Deg.	Date	Min. Deg	Date	No. of Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·05	— 1·12	·35	5	11	50·8	4	22·3	11	13	23
II.		Maidstone (Hunton Court)...	·85	— 1·55	·32	5	9	...	...	...	...	..	...
,,		Strathfield Turgiss	1·02	— 1·00	·33	5	12	50·6	17	19·3	11	15	19
III.		Hitchin	·77	— 1·28	·26	30	12	46·0	3	21·0	8*a*	20	...
,,		Banbury	·61	— 1·54	·14	5	12	50·0	3*b*	21·0	11	19	...
IV.		Bury St. Edmunds (Culford)	·95	— 1·20	·42	30	10	51·0	17	13·0	10	16	...
,,		Norwich (Cossey)	1·22	— 1·10	·30	30	12	50·5	17	19·0	12	12	19
V.		Weymouth(LangtonHerring)	1·77	...	·85	5	13	...	...	...	...	...	...
,,		Barnstaple.....	2·06	— 1·70	·63	5	14	56·0	1	22·0	11	...	...
,,		Bodmin	2·51	— 2·94	1·24	5	16	51·0	17	22·0	11	7	13
VI.		Stroud (Upfield)	1·06	— 1·37	·45	5	11	50·0	3*c*	20·0	10	17	...
,,		ChurchStretton(Woolstaston)	·91	— 1·88	·14	28	17	50·0	16*b*	22·0	8, 9	13	17
,,		Tenbury (Orleton)	·93	— 1·58	·20	28	15	52·3	17	17·3	11	17	19
VII.		Leicester	·65	...	·19	30	11	52·2	23	22·2	11	12	22
,,		Boston	·93	— 1·14	·33	30	8	50·0	16	17·0	11	14	...
,,		Grimsby (Killingholme).....	·84	— 1·59	·21	9	12	51·0	16	20·0	12	8	...
,,		Hesley Hall [Tickhill].....	·96	...	·25	4	11	54·0	16	21·0	10	12	...
VIII.		Manchester (Ardwick).....	2·65	+ ·12	·83	30	11	51·0	17	23·0	8*d*	10	...
IX.		Wetherby (Ribston Hall) ...	·31	— 1·90	...	...	...	...	...	...	...	...	...
,,		Skipton (Arncliffe)	3·41	— 1·87	·64	30	17	50·0	18	15·0	10	...	...
X.		North Shields	·96	— 2·13	·20	9	12	56·5	16	16·0	11	15	15
,,		Borrowdale (Seathwaite).....	7·54	— 6·19	1·41	30	19	52·8	16	17·7	8	13	...
XI.	WALES.	Cardiff (Ely).....	1·93	— 1·98	·58	5	17	...	...	...	...	...	...
,,		Haverfordwest	2·07	— 3·06	·50	5	10	53·0	16	18·0	10	9	15
,,		Plinlimmon (Cwmsymlog) ...	2·62	...	·67	30	14	...	...	...	...	..	...
,,		Llandudno.....	1·33	— 1·52	·40	30	8	54·0	3	28·0	10*e*	8	...
XII.	SCOTLAND.	Cargen [Dumfries]	2·17	— 2·36	·62	3	12	54·0	16	17·4	11	12	...
,,		Jedburgh (Sunnyside).....	·57	— 1·88	·24	30	7	56·0	2, 3	10·0	11	12	...
XIV.		Douglas Castle (Newmains)	...	...	...	...	...	...	...	...	...	...	...
XV.		Lochgilphead (Kilmory)	5·60	— ·58	1·25	30	23	...	...	...	...	..	...
,,		Oban (Craigvarren)	6·75	...	...	...	23	53·0	16	24·0	7	7	...
,,		Mull (Quinish).....	6·54	...	1·16	30	24	...	...	...	...	...	...
XVI.		Loch Leven Sluices	2·10	— 1·56	·80	4	9	...	...	...	...	...	...
,,		Arbroath	1·14	— 1·76	·30	3	10	54·0	16	21·0	7*e*	8	...
XVII.		Braemar	2·92	— ·51	·80	2	12	53·2	16	12·2	7	16	26
,,		Aberdeen	2·28	...	·67	21	16	57·0	16	22·0	10*e*	13	...
XVIII		Skye (Sligachan)	...	...	...	...	...	...	...	...	...	...	...
,,		Culloden	2·56	+ ·72	...	...	...	56·0	16	15·3	10	10	21
XIX.		Dunrobin	2·84	...	·56	4	12	58·0	16	21·0	7	11	...
,,		Orkney (Sandwick)	...	...	...	...	...	...	...	...	...	...	...
XX.	IRELAND.	Cork (Blackrock)	1·78	— 2·98	·29	19	19	57·0	2	24·0	8	9	...
,,		Dromore Castle	2·67	...	·55	2	12	55·0	18	25·0	22	...	...
,,		Waterford (Brook Lodge) ...	1·95	...	·49	5	15	51·5	3	21·5	11	9	18
,,		Killaloe	1·67	...	·27	27	18	56·0	19	23·0	8	15	...
XXI.		Portarlington	·73	— 2·13	·14	3	13	52·0	15	29·0	26	12	...
,,		Dublin (FitzWilliam Square)	·74	— 1·84	·16	5	10	57·7	16	24·3	11	7	17
XXII.		Ballinasloe	1·62	— 1·86	·53	20	21	52·0	16	19·0	11	14	..
XXIII		Waringstown	1·24	— 1·72	·34	28	11	56·0	16	18·0	10	13	14
,,		Londonderry (Creggan Res.).	2·80	...	·54	3	18	...	...	...	...	...	...
,,		Omagh (Edenfel)	1·86	— 1·54	·55	3	16	54·0	16	21·0	10	13	..

a And 10. *b* And 17. *c* And 31. *d* And 9, 11. *e* And 11.

\+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON DECEMBER.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—Cold, damp, foggy weather characterized the month, with occasional intervals of bright sunshine and paroxysms of severe early morning frosts; crops all that could be desired at the close.

BANBURY.—Mean temp. 37°·7. S on 3 days; high wind on 2; fog on 8.

CULFORD.—The temperature during the month was very fluctuating, the frost at times being very severe but not of long duration. S on 9th and 29th.

LANGTON HERRING.—The rainfall was 1·30 in. below the average of December for the last ten years; the mean temp. was more than half a degree below the average, and the pressure was higher than in any month since December, 1883; high winds on 4th and 28th, dense fog on 17th, L on 29th.

BODMIN.—Mean temp. 39°·4.

STROUD.—A cold, gloomy December with very little sun; slight S on the hills on 6th and 29th.

WOOLSTASTON.—The rainfall was very slight, but S fell on 5th, 6th, 28th, and 29th. A severe frost set in on 6th, which lasted a week. Mean temp. 37°·5.

ORLETON.—Mean temp. about 1°·3 below the average of 24 years. The first 12 days were very cold with much clear sky, and severe frost almost every night; the remainder of the month was very changeable with much cloud and fog and occasional frosts. Pressure high throughout, but fluctuating. The wind was frequently rough, especially on 4th and 28th. S on 6th, 28th, and 29th.

KILLINGHOLME.—The month was very dry until the closing days, when S fell which soon disappeared.

MANCHESTER.—December was rather wintry, but there was no fall of S. Hard frost prevailed for several days in the early part of the month, but it was then mild until the last three days. The weather generally was dull, gloomy, and damp, but no very dense fogs occurred. T on 4th.

NORTH SHIELDS.—Mock suns were seen on 28th and 31st; S fell on 6 days, fog occurred on 3.

WALES.

HAVERFORDWEST.—A dry December. Severe frost prevailed from 2nd to 10th, but the temperature for the whole month was rather above the average. During the continuance of the frost the sunsets were very grand and the colourings of the afterglow magnificent. On the 7th, the Precelly range was covered with S to the depth of several inches. From 12th to 19th the air was constantly damp and the sky overcast.

LLANDUDNO.—The wind and weather were rather variable, and there was more than the average amount of frost though of no great severity. The mean temp. was just half a degree below the average, the mean daily range being about half a degree above the average and the monthly range a degree and a half below it. Very little R fell, except on the last four days. S on 29th.

SCOTLAND.

CARGEN.—A dull, gloomy month, with great and sudden variations of temp. and pressure. Mean temp. 38°·8, exactly the average; severe frost prevailed from 6th to 11th. Only 39 hours of sunshine were recorded, the average being 59 hours; for 11 consecutive days (11th to 21st inclusive) only one hour of sunshine was recorded. Remarkably beautiful cloud effects were observed at sunset on 28th and 29th. Gale on 3rd, L on 28th, S on 29th.

JEDBURGH.—The weather was, on the whole, fine and open, and out-door work was scarcely impeded. Springs had not begun to rise, and the ground was very dry at the close. Very high winds prevailed from 27th to 30th inclusive. S on 5 days.

OBAN.—A month remarkable for extraordinary changes of weather and wind—from frost to R and gales. On the whole the commencement was seasonable and frosty, and the second half showery with very high temp, until the heavy S storm of 28th. An unusual absence of sunlight was noted. H on 3rd, 27th and 28th ; S on 28th and 29th ; aurora on 6th ; gales on 7 days.

ABERDEEN.—Rainfall more than an inch below the average ; aurora on 6th, H on 22nd ; S on 3 days.

CULLODEN.—The weather during the month was not very severe ; the keenest frost was from 5th to 11th, and during the remainder of the month the weather was fine and open. S fell to some depth twice.

IRELAND.

BLACKROCK.—The month was notably misty, with very little sunshine and frequent unexpected changes of temp. from unseasonable warmth to sharp frost. Mean temp. 41°·8.

DROMORE.—The month, though it commenced with a terrible storm from S.W., was very fine and mild.

WATERFORD.—A dry and generally mild month with a rainfall less than half the average. S on 4th and 6th ; dense fog on 20th.

KILLALOE.—Sharp frosts prevailed in the early nights of the month, with many bright fine days. The rainfall was light. Mean temp. 41°·0.

DUBLIN.—Very changeable as regards temperature, but generally a fine although cloudy month. Pressure considerably above the average. A sharp frost prevailed between 7th and 12th, and another brief cold spell occurred after the 27th. Mean temp. (42°·2) 0°·7 above the average ; mean humidity 84 ; mean amount of cloud 6·6 ; prevailing winds W., W.S.W., W.N.W. H on 7th and 28th, S and sleet on 4 days ; lunar corona on 23rd, fog on 7 days.

WARINGSTOWN.—A very dry month and, with the exception of one week's hard frost (from 5th to 12th), mild and pleasant.

EDENFEL.—With the exception of the week of dry and pleasant frost, which terminated on 11th, the month was unusually mild and calm, with scanty rainfall.

ROYAL METEOROLOGICAL SOCIETY.

The usual Monthly meeting of this Society was held on Wednesday evening, December the 11th, at the Institution of Civil Engineers ; Mr. R. H. Scott, F.R.S., president, in the chair.

Mr. J. Hartnup, Mr. A. W. Preston, Mr. R. Sheward, and Mr. W. B. Worthington, B.Sc., M.Inst. C.E., were balloted for and duly elected Fellows of the Society.

The following papers were read :—

(1.) "On the Influence of Forests upon Climate," by Dr. A. Woeikof, Hon.Mem.R.Met.Soc. The first step towards a scientific investigation of the influence of forests upon climate was taken by the establishment of the Bavarian Forest meteorological stations. This example was followed by Germany, France, Switzerland, Italy, and other countries. As a general result it was found that during the warmer season the air and earth temperatures were lower in the forest as compared with contiguous woodless places, that their variations were less, and that the relative humidity was greater. Dr. Woeikof's discussion of this question shows that in the western portions of the Old World extensive forests materially influence the temperature of neighbouring localities, and that the normal increase of temperature from the Atlantic Ocean towards the interior of the continent is not only interrupted by their agency, but they cause the

summer to be cooler in regions situated further in the interior than those nearer the sea. Hence forests exert an influence on climate which does not cease at their borders, but is felt over a greater or less district, according to the size, kind, or position of the forests. From this it naturally follows that man, by clearing the forests in one place and planting others in another, may considerably affect the climate.

(2.) "Report on the Phenological Observations for 1885," by the Rev. T. A. Preston, M.A., F.R.Met.Soc. The year has been a very dry one, and this has acted in such a manner on vegetation that although the winter was mild, plants were very late in flowering and lasted only a short time. The bloom was often profuse, and as bees and other insects could visit it, the crop of fruit was un-unusually great; the apples, for instance, were often of bad quality owing to the enormous number on the trees; whilst in the case of wild fruits, the brilliant colour of the bushes when in fruit was quite as beautiful as when in bloom. But at the same time the drought acted very prejudicially, especially to root crops and bush fruit, as well as to strawberries. In the case of the root crops, the seed had great difficulty in germinating, and the weak plants were at once overpowered by insect pests, so that the crops of turnips were generally complete failures. The insect pests also did much damage to bush fruit, while the drought prevented the strawberries from swelling. The corn did not suffer to any great extent, the dry season allowing the land to be prepared; and although the straw was often short, the yield was not unsatisfactory. A general absence of butterflies was noticed in some places. In the south of England the white butterflies were at one time most abundant, but the autumn butterflies were not so plentiful as usual.

(3.) "Etudes sur les crépuscules rosées," by Prof. A. Ricco of Palermo.

(4.) "The Storm of October 15th, 1885 at Partenkirchen, Bavaria," by Col. M. F. Ward, F.R.Met.Soc. This was the most destructive storm which has occurred in this valley since the winter of 1821-22. The storm burst suddenly at 7 p.m., and lasted about half-an-hour, but in that short period nearly every house was unroofed, and it is computed that in one forest alone above 250,000 trees were laid prostrate.

THE BIELA METEORS.

We regret that a perfectly formed χ (chi) in Col. Ward's letter (p. 163) was misprinted as γ (gamma), and that we failed to notice it when reading the proof. The meteors were expected to radiate from γ Andromedæ; the observed radiant was by some observers stated to be an area of some extent, by others, as by Col. Ward, it was defined as near an individual star, in his case χ *not* γ Andromedæ.